FIG 4 shows, referred to FIG 3, a synchronizing situation of the radio cells FZ1 to FZ3 that corresponds to the prior art.

It is assumed below that the system is a time-synchronized radio communication system whose adjacent radio cells FZ1 to FZ3 have a "frequency reuse" factor of one, which is to say the radio cells FZ1 to FZ3 employ the same carrier frequencies.

Each base station BTS01 to BTS03 and the mobile stations T01 to T012 assigned to each base station BTS01 to BTS03 have in each case a base-station-specific carrier frequency deviation Delta01 to Delta03 which deviates from a predefined value MIT and is plotted vertically. Said carrier frequency deviation Delta01 to Delta03 is due in each of the individual base stations BTS01 to BTS03 to electrical components of the respective base station, for example to base-station-specific local oscillators.

In particular when OFDM radio transmission technologies are used in a synchronous radio communication system, the fast data rates employed necessitate extremely accurate synchronizing which, however, can only be implemented at very high cost.

A method for synchronizing base stations in a PCS network is known from WO 01/20818 A1. In said method a mobile station uses an integrated GPS receiver to determine both its own position as well as what is referred to as a "bias term". The position and the bias term are used to determine an offset between a local time of the mobile station and the GPS time.

This offset is transmitted to the base station and used in the base station for time synchronization taking into account the position information. A time referred to as the "system time" is transmitted by the base station as the local time for the mobile station.

A method is known from WO 97/12489 A1 wherein, in order to reduce interference in the case of a predefined "frequency reuse", available frequencies are split up into time slots and allocated to respective mobile subscriber units. Possible interference between signals is avoided by suitable assignment of the signals to different time slots.

The object of the present invention is to disclose a low-cost synchronizing method for a cellular radio transmission system, in particular for an OFDM radio communication system.

Said object of the invention is achieved by means of the features of claim 1. Advantageous developments are cited in the subclaims.

Claims

1. A method for synchronizing a radio communication system divided into radio cells (FZ1, ..., FZ3)
   - wherein data is transmitted by means of multiple access methods and wherein each radio cell (FZ1, ...) has a base station (BTS1, ..., BTS3) for radio provisioning a plurality of mobile stations (T11, ..., T33) assigned to the radio cell (FZ1, ...),

   characterized in that
   - alongside mobile station signals of its own radio cell (FZ1), a base station (BTS1) also receives mobile station signals from adjacent radio cells (FZ2, FZ3),
   - from the received mobile station signals the base station (BTS1) determines a synchronizing value for time synchronizing and/or frequency synchronizing to which the base station (BTS1) synchronizes itself,
   - alongside base station signals of its own radio cell (FZ1), a mobile station (T13) also receives base station signals from adjacent radio cells (FZ2, FZ3), and
   - from the received base station signals the mobile station (T13) determines a synchronizing value for time synchronizing and/or frequency synchronizing from the received base station signals to which the mobile station (T13) synchronizes itself.

2. The method according to claim 1, characterized in that adjacent base stations (BTS1, BTS2, BTS3) employ radio transmission resources from a stock commonly assigned to the base stations (BTS1, ...) for data transmission.

3. The method according to claim 2, characterized in that the base stations (BTS1, ...) employ timeslots (TS1, ...) of commonly assigned carrier frequencies (f1, ..., f12) as

radio transmission resources.

4. The method according to claim 2 or 3, characterized in that at least two adjacent base stations (BTS1, BTS3) simultaneously and jointly employ a timeslot (TS5) of a carrier frequency (f5) for radio provisioning a respectively assigned mobile station (T14, T32) and the timeslot (TS5) is selected from the commonly assigned radio transmission resources taking account of an interference situation in the timeslot (TS5).

5. The method according to one of the preceding claims, characterized in that, for synchronizing, the base station and/or mobile station adjust(s) carrier frequencies and timeslot-transmitting instants employed.

6. The method according to one of the preceding claims, characterized in that co-channel interference is reduced on the base station and/or mobile station by means of interference suppression methods.

7. The method according to one of the preceding claims, characterized in that radio transmission resources are assigned on the base station side in such a way that co-channel interference in adjacent radio cells is minimized.

8. The method according to one of the preceding claims, characterized in that an OFDM radio transmission method is employed.

9. The method according to one of the preceding claims characterized in that a TDD or FDD radio transmission method is employed.

10. The method according to claim 8, characterized in that a time deviation is determined through correlating and a frequency deviation is determined by ascertaining a phase rotation of consecutive symbols following a transformation into the frequency range.

11. The method according to one of the preceding claims, characterized in that the radio communication system is synchronized with no additional signaling using a higher protocol layer between the base station and assigned mobile station.

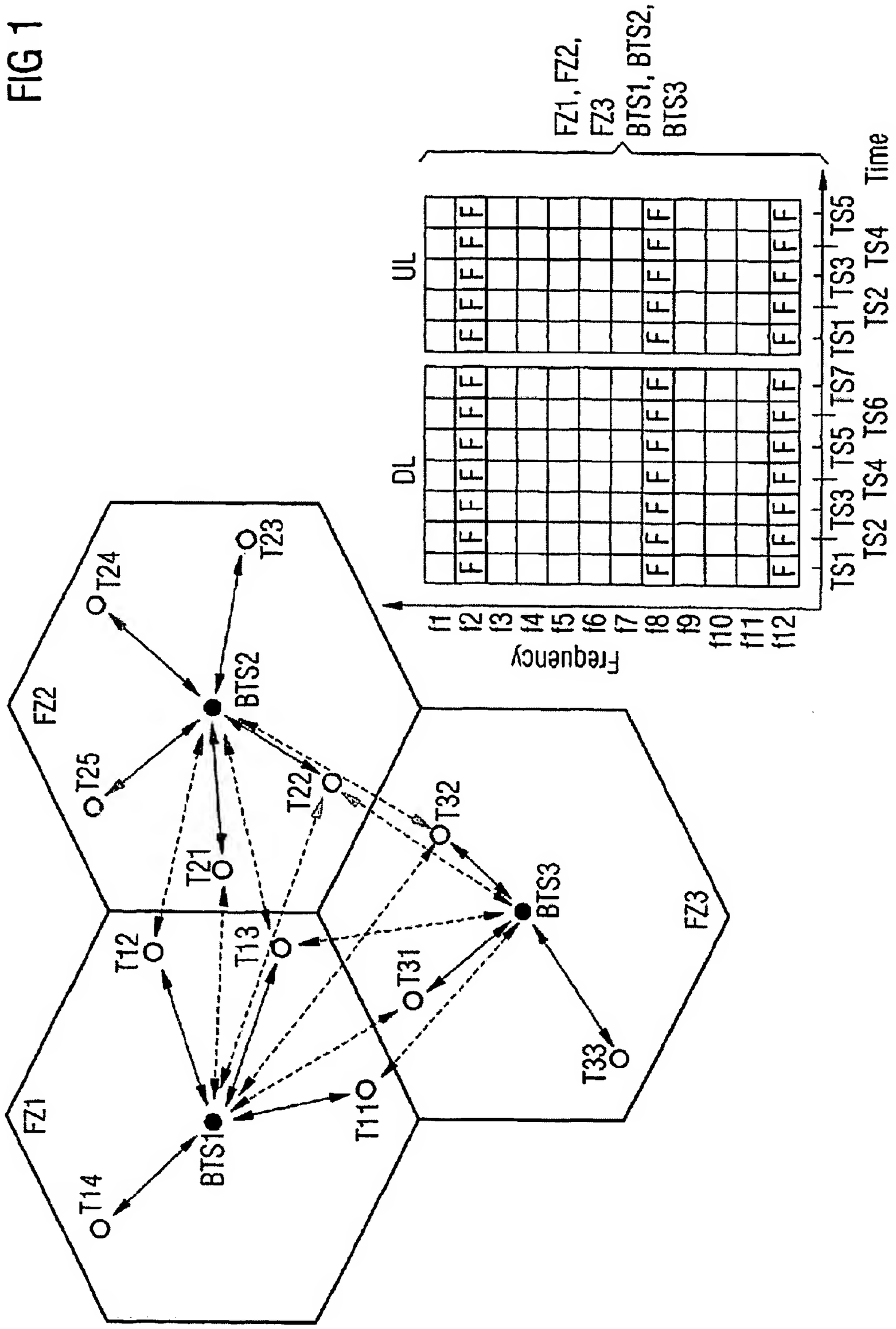
12. A base station, characterized by means for implementing the method according to one of the claims 1 to 11.

13. A mobile station, characterized by means for implementing the method according to one of the claims 1 to 11.

14. A radio communication system, characterized by at least one base station according to claim 12.

16. A radio communication system, characterized by at least one mobile station according to claim 13.

FIG 1


FZ1, FZ2,
FZ3
BTS1, BTS2,
BTS3
UL
DL
Time
TS1 TS3 TS5 TS7
TS2 TS4 TS6
Frequency
f1 f2 f3 f4 f5 f6 f7 f8 f9 f10 f11 f12
FZ1
FZ2
FZ3
BTS1
BTS2
BTS3
T11
T12
T13
T14
T21
T22
T23
T24
T25
T31
T32
T33

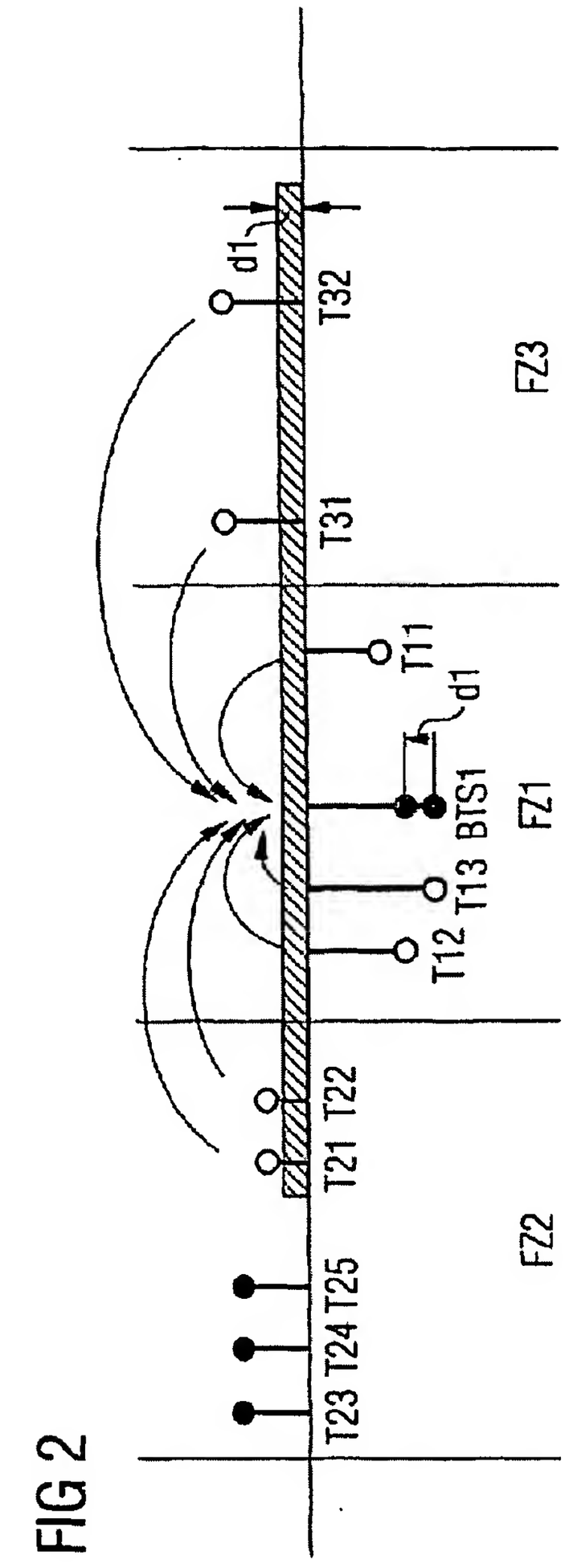
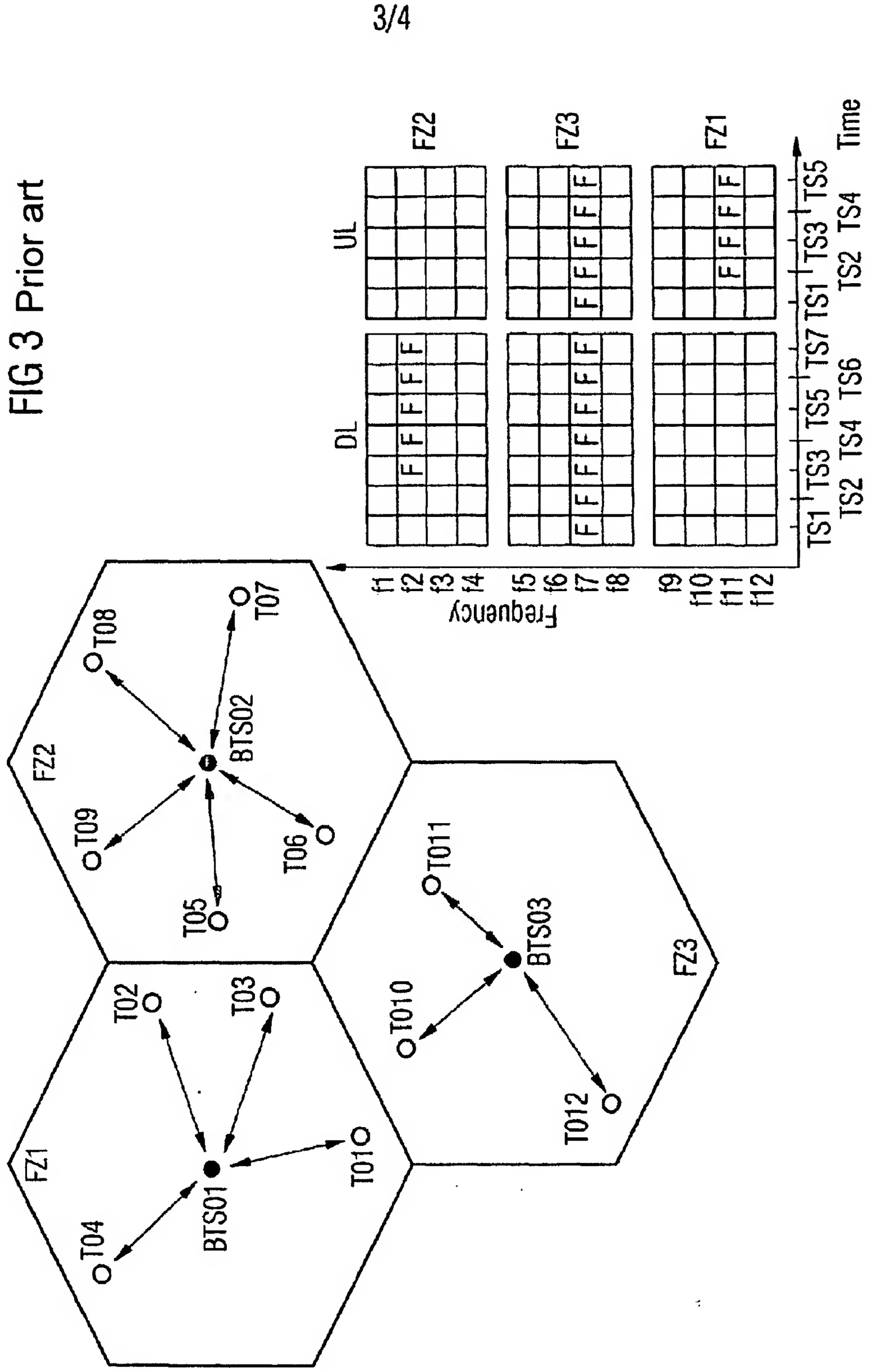


FIG 2

FIG 3 Prior art



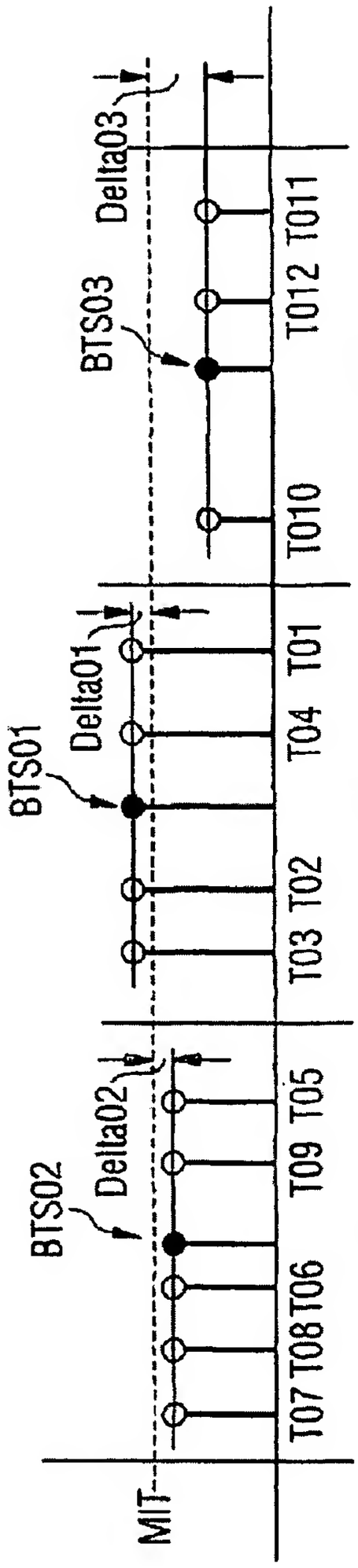


FIG 4 Prior art